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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference H2496 PCT		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/US 03/01765	International filing date (day/month/year) 21.01.2003	Priority date (day/month/year) 08.02.2002	
International Patent Classification (IPC) or both national classification and IPC G02B6/38			
Applicant 3M INNOVATIVE PROPERTIES COMPANY			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 3 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand 22.08.2003		Date of completion of this report 31.03.2004	
Name and mailing address of the international preliminary examining authority:  European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840		Authorized Officer Verdrager, V Telephone No. +49 30 25901-648 	

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/US 03/01765**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-7, 9-12 as originally filed
8 received on 04.02.2004 with letter of 02.02.2004

Claims, Numbers

1-9 received on 04.02.2004 with letter of 02.02.2004

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-9
	No: Claims	
Inventive step (IS)	Yes: Claims	1-9
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-9
	No: Claims	

2. Citations and explanations

see separate sheet

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EXAMINATION REPORT - SEPARATE SHEET**

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Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Cited documents

1.1 The following documents are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

- D1-JP: PATENT ABSTRACTS OF JAPAN vol. 2000, no. 15, 6 April 2001
(2001-04-06) -& JP 2000 354970 A (FUJI PHOTO FILM CO LTD), 26
December 2000 (2000-12-26)
- D1-US: US-B1-6 443 827 (RYOKE KATSUMI ET AL) 3 September 2002
(2002-09-03)
- D2: WO 01 45903 A (OHISHI MICHIMIRO ;3M INNOVATIVE PROPERTIES CO
(US)) 28 June 2001 (2001-06-28)
- D3: US-A-6 165 239 (STOFKO JOHN J ET AL) 26 December 2000 (2000-12-
26)

D1-US is the US equivalent of D1-JP, which is more comprehensible than the machine translation of D1-JP.

2. Novelty and inventive step

2.1 The present application does meet the requirements of Articles 33(2) and 33(3) PCT, because the subject-matter of claims 1-9 is new and inventive.

2.2a The subject-matter of present claim 1 relates to a process for finish-abrading an optical-fiber connector end-surface.

2.2b The closest prior art is represented by document D1, which discloses a process for finish-abrading an optical-fiber-connector end-surface (D1-JP: abstract, figure 1: (5)) which comprises a step of abrading an optical-fiber connector end-surface with using an abrasive film (D1-JP: figure 1: (1)) composed of abrasive grains (D1-

JP: abstract; paragraph [0010], figure 1: (3)) fixed on a film-form substrate (D1-JP: abstract; paragraph [0010], figure 1: (2)), in the presence of a lubricating liquid (D1-JP: figure 1: (16)).

2.2c The difference between the subject-matter set out in claim 1 and that of D1 is that the lubricating liquid of claim 1 is an aqueous solution containing a hydrophilic surfactant, and not merely water or a silica slurry as described in D1 (D1-JP: paragraph [0012],[0024]).

2.2d The technical problem to be solved by the present invention is to provide a process for finish-abrading an optical fiber-connector end-surface without generating abrasion scratch on an abraded surface of an optical fiber, while reducing or eliminating the generation of substance adhered to the optical fiber.

2.2e The specific features of the solution provided by claim 1 are neither disclosed in nor rendered obvious by either one of the prior art documents listed in the European search report.

D1 suggests to use a surfactant not in the polishing liquid, but in the polishing layer (D1-JP: paragraph [0036],[0046]). The problem of keeping the abraded fiber surface clean is not addressed in D1. In the process of claim 1, a hydrophobic group of the surfactant is oriented to surfaces of the abrasive layer and the abrasion dusts, a hydrophilic group thereof is oriented to the contrary when a surfactant is added to the water to be used as a lubricating liquid, therefore a layer of the surfactant in molecular order is formed. Due to layers made of the surfactant and water, directly contacting area during abrasion between abrasive grains and the surface to be abraded is reduced, dispersion of abrasion dusts into the lubricating liquid is improved, readhering to the surface to be abraded is controlled, and an abraded surface is kept clean.

Therefore, the subject-matter of present claim 1 is considered to be both novel and inventive (Articles 33(2) and 33(3) PCT).

2.3 The subject-matter of claims 2-9, dependent on claim 1, is therefore also new and inventive (Articles 33(2) and 33(3) PCT).

3. Formal aspects

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- 3.1 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT.
- 3.2 The requirements of Rule 5.1(a)(ii) are not met because the documents D1 and D2 are not identified in the description and the relevant background art disclosed therein is not discussed.

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surfactant in molecular order is formed. Due to layers made of the surfactant and water, directly contacting area during abrasion between abrasive grains and the surface to be abraded is reduced, dispersion of abrasion dusts into the lubricating liquid is improved, re-adhering to the surface to be abraded is controlled, and an abraded surface is kept clean.

5 As the surfactant, it is preferred that hydrophilic surfactants, particularly an anionic surfactant and a nonionic surfactant are employed. Preferred nonionic surfactant includes those having a HLB ^(hydrophilic lipophilic balance) value of 8 to 20, particularly 10 to 20. If the HLB value of the surfactant is less than 8, the above described advantage is not obtained because the lubricating liquid tends to form without emulsion.

10 Preferred examples of the anionic surfactant include alkylbenzene sulfonate. Specifically, sodium dodecylbenzene sulfonate is preferred. The preferred examples of the nonionic surfactant include polyoxyalkylene nonyl phenyl ether, such as polyoxyethylene nonyl phenyl ether and oxyethylene oxypropylene block copolymer.

The surfactant is contained in the lubricating liquid in an amount of 0.5 to 20% by weight, preferably 1.0 to 15% by weight, more preferably 1.0 to 10% by weight. If the content of the surfactant is less than 0.5% by weight, the effect of controlling adherence becomes poor. If it is more than 20% by weight, the lubricating liquid becomes viscous, and abrasion error may occur.

20 Examples

The present invention will be described in more detail by way of the following examples. However, the present invention is not limited by these examples.

An abrasive material coating liquid was prepared by mixing the components shown in Table 1.

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Claims:

1. A process for finish-abrading an optical-fiber-connector end-surface which comprises a step of abrading an optical-fiber-connector end-surface with using an abrasive film composed of abrasive grains fixed on a film-form substrate, in the presence of a lubricating liquid,

wherein the lubricating liquid is an aqueous solution containing a hydrophilic surfactant.

2. The process according to claim 1, wherein the abrasive film comprises an abrasive layer which has abrasive grains and a binder, on a film-form substrate.

3. The process according to claim 1, wherein the abrasive grains comprise silica having a grain size of 1 to 500 nm.

4. The process according to claim 2, wherein the binder has a Young's modulus of 1 to 500 MPa.

5. The process according to claim 2, wherein the abrasive layer has a three-dimensional structure constructed with a plurality of regularly arranged three-dimensional elements having a predetermined shape.

6. The process according to claim 5, wherein tops of said three-dimensional elements are constructed with lines parallel to a surface of the substrate, and the lines are located on a plane parallel to the surface of the substrate.

7. The process according to any one of claims 1 to 6, wherein the surfactant is an anionic surfactant.

5 8. The process according to any one of claims 1 to 6, wherein the surfactant is a nonionic surfactant having a HLB^(hydrophilic lipophilic balance) value of 8 to 20.

9. The process according to claim 1, wherein the lubricating liquid has a content of a surfactant of 0.5 to 10% by weight.